

**AMENDMENTS TO THE CLAIMS**

**Please amend the claims as follows.**

1. (Currently Amended) A method for determining a metabolic phenotype of an organism, comprising:

providing a table of metabolic reactions known to take place in the organism, wherein the products of at least one metabolic reaction are linked to the reactants of another metabolic reaction;

determining a candidate metabolic gene on the organism's genome;

providing the nucleotide sequence of the open reading frame of the candidate metabolic gene;

assigning a function to the candidate metabolic gene based on its nucleotide or amino acid homology to other, known metabolic genes;

determining the metabolic reaction of the gene product of the candidate metabolic gene based on the assigned function of the candidate metabolic gene;

adding the metabolic reaction of the candidate metabolic gene to the table of metabolic reactions; and

determining a metabolic phenotype of the organism by performing ~~a mathematical analysis of the table of metabolic reactions~~ a flux balance analysis on said table of metabolic reactions.

2. (Cancelled)

3. (Currently Amended) The method of Claim 1, wherein identifying a metabolic phenotype comprises ~~comprising~~ identifying a metabolic gene that when removed from the table of metabolic reactions would result in a lethal phenotype.

4. (Currently Amended) The method of Claim 1, wherein identifying a metabolic phenotype comprises ~~comprising~~ reducing the flux of the metabolic reaction of the candidate metabolic gene in said table of metabolic reactions to determine whether the reduction would result in a lethal phenotype.

5. (Currently Amended) The method of Claim 1, wherein the metabolic phenotype is selected from the group consisting of: growth, increased metabolite secretion and increased protein secretion.

6. (Currently Amended) The method of Claim 1, wherein identifying a metabolic phenotype comprises ~~comprising~~ determining the minimal media composition required to sustain growth of the organism.

7. (Currently Amended) The method of Claim 1, wherein identifying a metabolic phenotype comprises ~~comprising~~ determining the optimal requirements for maximizing a growth phenotype of the organism.

8. (Currently Amended) The method of Claim 1, wherein identifying a metabolic phenotype comprises ~~comprising~~ determining the genes in the organism necessary to sustain highest level of growth under a particular environmental condition.

9. (Cancelled)

10. (Cancelled)

11. (Cancelled)

12. (Currently Amended) A computer system comprising a memory having instructions that when executed perform the steps of:

providing a table of metabolic reactions known to take place in the organism, wherein the products of at least one metabolic reaction are linked to the reactants of another metabolic reaction;

determining a candidate metabolic gene on the organism's genome;

providing the nucleotide sequence of the open reading frame of the candidate metabolic gene;

assigning a function to the candidate metabolic gene based on its nucleotide or amino acid homology to other, known metabolic genes;

determining the metabolic reaction of the gene product of the candidate metabolic gene based on the assigned function of the candidate metabolic gene;

adding the metabolic reaction of the candidate metabolic gene to the table of metabolic reactions; and

determining a metabolic phenotype of the organism by performing a ~~mathematical analysis of a flux balance analysis on~~ the table of metabolic reactions.

13. (Original) The computer system of Claim 12, wherein said memory is selected from the group consisting of: a hard disk, optical memory, Random Access Memory, Read Only Memory and Flash Memory.

14. (Cancelled)

15. (Currently Amended) The computer system of Claim 12, comprising instructions that when executed perform a the method of determining a phenotype of the organism by identifying a metabolic gene that when removed from the table of metabolic reactions would result in a lethal phenotype.

16. (Currently Amended) The computer system of Claim 15, comprising instructions that when executed perform a the method of determining a phenotype of the organism by reducing the flux of the metabolic reaction of the candidate metabolic gene to determine whether the reduction would result in a lethal phenotype.[.]

17. (Original) The computer system of Claim 12, wherein the phenotype is selected from the group consisting of: growth, increased metabolite secretion and increased protein secretion.

18. (Currently Amended) The computer system of Claim 12, comprising instructions that when executed perform a the method of determining a phenotype of the organism by determining the minimal media composition required to sustain growth of the organism.

19. (Currently Amended) The computer system of Claim 12, comprising instructions that when executed perform a the method of determining a phenotype of the organism by determining the optimal requirements for maximizing a growth phenotype of the organism.

20. (Currently Amended) The computer system of Claim 12, comprising instructions that when executed perform a the method of determining a phenotype of the organism by determining the genes in the organism necessary to sustain highest level of growth under a particular environmental condition.

21. (Cancelled)

22. (Cancelled)

23. (Cancelled)

**Please add the following new Claims:**

24. (New) A method for creating a metabolic network representing metabolic reactions that take place in an organism, comprising:

providing a table of reactants and products from metabolic reactions known to take place in an organism;

selecting a nucleic acid sequence corresponding to a gene of unknown function in said organism; and

determining whether said nucleic acid sequence corresponds to a metabolic gene in said organism, based on the homology of the nucleic acid sequence to metabolic genes of other organisms,

wherein if the nucleic acid sequence is found to be a metabolic gene, then reactants, products and stoichiometry from a gene product of said metabolic gene are added to the table of reactants and products to create a metabolic network for said organism.

25. (New) The method of Claim 24, wherein determining whether said nucleic acid sequence corresponds to a metabolic gene comprises determining whether said gene product corresponds to a gene product involved in cellular metabolism.

26. (New) The method of Claim 25, wherein determining whether said nucleic acid sequence corresponds to a gene involved in cellular metabolism comprises determining whether said gene product corresponds to a gene product selected from the group consisting of: a central metabolism gene product, an amino acid metabolism gene product, a nucleotide metabolism gene product, a fatty acid metabolism gene product, a lipid metabolism gene product, a carbohydrate assimilation gene product, a vitamin biosynthesis gene product, a cofactor biosynthesis gene product, an energy generation gene product and a redox generation gene product.

27. (New) The method of Claim 24, wherein said method is performed by a computer.

28. (New) The method of Claim 24, further comprising applying constraints on said metabolic network that reflect the metabolic requirements of said organism.

29. (New) The method of Claim 28, further comprising performing a flux balance analysis of said metabolic network to infer whether said organism can survive under said constraints.

30. (New) The method of Claim 28, wherein said constraints represent the minimal media composition required to sustain growth of the organism.

31. (New) The method of Claim 28, wherein said constraints represent the optimal requirements for maximizing growth of the organism.

32. (New) The method of Claim 24, wherein said metabolic network is represented by a stoichiometric matrix.

33. (New) A system for providing a metabolic network representing metabolic reactions that take place in an organism, comprising:

a table of reactants and products from metabolic reactions known to take place in an organism;

a first process for determining reactants, products and stoichiometry of a metabolic reaction from a gene product encoded by a gene of unknown function in said organism; and

a second process for determining whether said gene corresponds to a metabolic gene in said organism, based on the homology of the gene to metabolic genes of other organisms,

wherein if the gene is found to be a metabolic gene, then the reactants, products and stoichiometry of said gene product are added to the table of reactants and products to create a system for representing the reactions that take place in said organism.

34. (New) The system of Claim 33, wherein determining whether said gene corresponds to a metabolic gene comprises determining whether said gene product corresponds to a gene product involved in cellular metabolism.

35. (New) The system of Claim 34, wherein determining whether said gene corresponds to a gene involved in cellular metabolism comprises determining whether said gene product is selected from the group consisting of: a central metabolism gene product, an amino acid metabolism gene product, a nucleotide metabolism gene product, a fatty acid metabolism gene product, a lipid metabolism gene product, a carbohydrate assimilation gene product, a

vitamin biosynthesis gene product, a cofactor biosynthesis gene product, an energy generation gene product and a redox generation gene product.

36. (New) The system of Claim 33, wherein said method is performed by a computer.

37. (New) The system of Claim 33, further comprising applying constraints on said metabolic network that reflect the metabolic requirements of said organism.

38. (New) The system of Claim 37, further comprising performing a flux balance analysis of said metabolic network to infer whether said organism can survive under said constraints.

39. (New) The system of Claim 37, wherein said constraints represent the minimal media composition required to sustain growth of the organism.

40. (New) The system of Claim 33, wherein said constraints represent the optimal requirements for maximizing growth of the organism.

41. (New) A system for representing metabolic reactions that take place in an organism, comprising:

a metabolic network comprising a table of reactants and products representing metabolic reactions that take place in an organism, wherein at least one of the metabolic reactions were determined by a process comprising:

determining a gene that encodes a gene product of unknown function in said organism; and

determining whether said gene corresponds to a metabolic gene in said organism, based on the homology of the gene to metabolic genes of other organisms,

wherein if the gene is found to be a metabolic gene, then reactants, products and stoichiometry from metabolic reactions of said gene product are added to the table of reactants and products.

42. (New) The system of Claim 41, wherein determining whether said gene corresponds to a metabolic gene comprises determining whether said gene encodes a gene product involved in cellular metabolism.

43. (New) The system of Claim 42, wherein determining whether said gene corresponds to a gene involved in cellular metabolism comprises determining whether said gene

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encodes a gene product selected from the group consisting of: a central metabolism gene product, an amino acid metabolism gene product, a nucleotide metabolism gene product, a fatty acid metabolism gene product, a lipid metabolism gene product, a carbohydrate assimilation gene product, a vitamin biosynthesis gene product, a cofactor biosynthesis gene product, an energy generation gene product and a redox generation gene product.

44. (New) The system of Claim 41, wherein said method is performed by a computer.

45. (New) The system of Claim 41, further comprising applying constraints on said metabolic network that reflect the metabolic requirements of said organism.

46. (New) The system of Claim 45, further comprising performing a flux balance analysis of said metabolic network to infer whether said organism can survive under said constraints.

47. (New) The system of Claim 45, wherein said constraints represent the minimal media composition required to sustain growth of the organism.

48. (New) The system of Claim 41, wherein said constraints represent the optimal requirements for maximizing growth of the organism.